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—as the author allows us to do—it is possible that things-in-themselves would wear a different aspect. (4) The theory of extra-mental realities proves to be superfluous for the immediate satisfaction of parallelistic doctrine; for the *individual mind* is the only real side of brain-events and brain events are the only fragments of the physical world that parallelism is concerned with. All other realities remain as a kind of adhesive medium whose difficult function it is to prevent a pluralism of individual minds. (5) If the reviewer has not missed the author's meaning, the theory of psychophysical idealism parallels reality—in so far as reality is individual mind—with two, not one, phenomenal 'symbols.' For the physical object, since it is a 'modification of consciousness,' must be a symbolic, phenomenal modification of that consciousness; but that same consciousness is already represented symbolically by its brain-event. Another difficulty arises: the physical object represents not only consciousness but also the real thing-in-itself for which it appears. We have, then, one reality (consciousness) with two symbols and one symbol (physical object) with two realities. The obvious way out is solipsism; *i.e.*, the thing-in-itself is identical with the individual consciousness. Even this solution is not highly satisfactory, for it leaves us with the paradox: reality as individual consciousness is paralleled by object of perception, as thing-in-itself by brain-event—whereas it ought to come out just the other way round. Then, too, solipsism brings back the old difficulty of pluralism. (6) In the latter discussion of parallelistic theories, Fechner's name is conspicuous for its absence,—though his historical importance is acknowledged in the preface,—and Wundt's theory of 'actuality' should have had at least a paragraph. This criticism might, indeed, be made more general; for references to the current literature are almost entirely wanting. The reviewer would consider this omission serious where the book is to be placed in the hands of students. The author has recently (*Psych. Rev.* XI, No. 1, p. 67) supplied a partial list of references.

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I. MADISON BENTLEY.

*Die reproduzierende Vorstellung beim Wiedererkennen und beim Vergleichen.* E. A. MCC. GAMBLE AND M. W. CALKINS. *Zeitschrift für Psych. u. Physiol. der Sinnesorgane*, XXXII, pp. 177-199; and XXXIII, pp. 161-170.

This paper states the results of an experimental investigation of the theory of Lehmann, that recognition consists in the image, or series of images, associated with the experience which is felt to be familiar. The introduction contrasts the doctrine of Lehmann (1) with the theories by which recognition is, or includes, a complex of affectively toned organic sensations, and (2) with the doctrine that the essential feature of recognition is an unsensational and unaffectionate content of consciousness—a certain distinctive "feeling of familiarity."

The experiments fall into two groups, each suggested by tests made by Lehmann himself. The first set of experiments furnishes data for a statistical analysis of recognition. The subject was given a series of odors in absolutely uniform bottles, and was required (1) to write down after smelling each odor, the associated images as nearly in their order as possible, (2) to mark with a dash any pause in the train of images, (3) to state in writing whether the smell was familiar or unfamiliar, and (4) to set down its name if known. The average number of odors used was forty-six. The total number of subjects was twenty-four. Of these subjects, twenty-one were undergraduate students and three were teachers of psychology. No subject understood the purpose of the experiment. In stating the results, the

smelling of each odor by each subject is counted as one "case." The total number of cases is 1,106.

The results furnish three arguments against the Lehmann theory. First, as in Lehmann's own results, there was a small percentage of the total number of cases (.9% for the practiced and 4.7% for the unpracticed observers), in which recognition appeared to occur without supplementary associations. It seems unlikely that recognition consists essentially of experiences too fleeting or too obscure to be detected introspectively. Second, in 6.2% of the total number of cases, smells were pronounced unfamiliar despite the fact that associations were recorded which were "correct" in the sense of being clearly explicable by former experiences of the same or of similar smells. For the verification of this most important point, a separate count was made of the cases in which olfactory associations (smell-names, not necessarily smell-images) occurred. The total number of such cases was 700. In 97 of these cases the smells were pronounced unfamiliar. In 62.9% of these 97 cases, the olfactory associations included or consisted of the names of smells which were similar strictly (according to Zwaardemaker's classification) as odors and not merely in affective value. Third, in 23.9% of the 869 cases in which the odors were pronounced familiar, the supplementary associations are expressly indicated as coming later than the feeling of familiarity.

The same set of results furnish data for two incidental conclusions. First, the time-notes of the observers showed that in many cases neither the feeling of familiarity nor the feeling of unfamiliarity as understood by them supervened directly upon the sensing of the stimulus. In the interval consciousness was filled simply with the sensation. Thus, the feeling of unfamiliarity seems to be a positive experience and not merely a negation of familiarity feeling. Second, out of 233 cases in which the odor was correctly named, in 76.4% the name given was the first association in a series, whereas in only 9% was it the last association. These figures bring out the high suggestive value of the name; they do not tend to show that the name caps and completes recognition by closing the association series.

Furthermore, it is worthy of incidental notice, that the records contain a few spontaneous references to the "effort" to recognize or to the "relief" of recognition. The fact that these remarks were unsolicited lends support to the view that organic sensations play an important part in recognition. Moreover, there is one statement in the records which might possibly be interpreted as a reference to a non-sensational and non-affective consciousness of familiarity.

Aside from these references, the outcome of the experiments is purely negative and may be stated thus: The recognition consciousness is not constituted by associated images whatever it may actually consist in and however generally such associations may be present in it.

The second group of experiments consisted in tests of qualitative discrimination for named stimuli as compared with unnamed stimuli of the same character. Both colors and smells were used. The colors, in the form of blue and purple liquids and of (Marbe's) blue and gray papers were alike in hue but were graduated in brightness with nine colors to a series. The odors consisted of groups of seven piney essential oils and seven artificial perfumes. Before the discrimination experiments were made, a set of names (scale-names, such as "Lightest" and "Very light," for the colors, and individual names, such as "Syringa" and "Rosemary," for the smells) were impressed upon the observer for one or the other of the two comparable sets of stimuli. As indicated above, the object of the experiment was to ascertain whether verbal associations attached to the one set of stimuli would

make discrimination more accurate for it than for the other. Each color was compared only with its own next neighbor in the series whereas each odor was compared with every other odor in the same group. In a certain proportion of the comparisons, the same color or odor was repeated. The interval between the stimuli compared was one minute *minus* the seconds of the first exposure-time, namely, ten seconds for the odors, five seconds for the colored papers and two seconds for the colored liquids. The subjects were all under-graduates, three or four in number for each two sets of comparable stimuli. Each observer made at least one hundred comparisons within each set of stimuli.

A comparison of the number of errors for the named and for the unnamed stimuli shows that a scheme of names was of slight assistance to three-fifths of our subjects in qualitative discrimination, but that the advantage was trifling, not a gain of 5% of right cases for the named series. An examination, however, of the direction of errors so appertained shows that at least, in the case of the colors the name-images aided only in discrimination proper, and actually increased the number of failures to identify. When the stimulus was repeated the percentage of wrong cases in the named series exceeded by ten the percentage in the unnamed series. Thus, it would appear that in so far as recognition is equivalent to the consciousness of sameness, associations artificially provided in the form of verbal tags tend rather to inhibit than to facilitate its occurrence. The result, therefore, of the investigation as a whole is to discount the value of supplementary associations both in recognition and in comparison.

ELEANOR A. McC. GAMBLE.

*On the Validity of the Ergograph as a Measurer of Work Capacity. A Contribution to Practice and Learning*, by T. L. BOLTON and ELEANORA T. MILLER. Nebraska University Studies, Lincoln, 1904, pp. 79-128.

This article gives the results of an experimental study with the ergograph, with the object of determining the value of ergograph records as an accurate measure of work capacity. A detailed analysis of the various factors that enter in determining the ergograph results furnishes the basis for such determination. Thus directed, the study gives results of psychological interest beyond that of merely determining the value of an apparatus. Some general observations on the factors in muscular training, and 'physiological considerations' are first briefly reviewed. Their object then becomes that of a scientific study of these supposed factors. The authors were the two subjects in the experiment, which extended over three months. A procedure similar to the usual in ergograph work was followed. "The ergograph used was a modified form of the pattern designed by Dr. Hoch in Kraepelin's laboratory." A plate, with description, gives the details of the apparatus. Introspective results supplement and interpret the eight full tables given. Four elements in practice gain are first pointed out and described. *First*, inurement, 'a process of hardening and toughening of the skin where it comes in contact with the apparatus, and of habituating the muscles to the strains which the unusual effort imposes.' The severe strain the authors regard as causing 'small leisons of the tissues through the rubbing and twisting of muscular and tendonal fibres about one another which are followed by local inflammations.' This inurement appears rapidly, and is completed before any of the other effects of practice. It is also the first to disappear when work ceases. *Second*, perfection in the co-ordination of movements. At first there are various accessory and useless movements, muscles in the other fingers of the hand, and various other muscles over the whole body being involved